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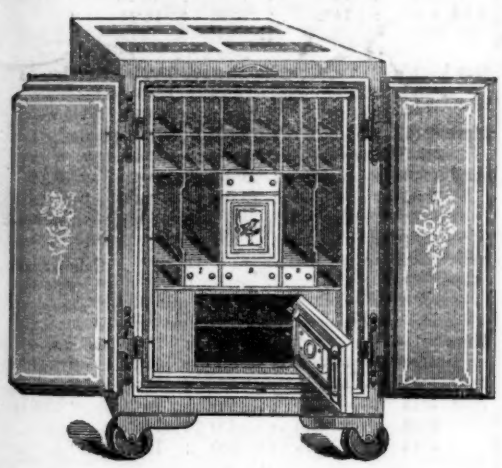
Safes.

Wilder's Patent Salamander Safe, was invented and patented by Mr. Daniel Fitzgerald, in 1843, and sold and assigned by him to Mr. G. B. Wilder. It has always been known and called by its present name. The patent was infringed upon, and the infringement became the subject of long litigation—the ground taken by the infringers being that the peculiar use of plaster of Paris, which constitute an important feature in the invention was not patentable. The parties to the suit were Mr. Wilder on one side, and Silas C. Herring and Stearns & Marvin on the other—the result of the litigation being that the United States Court sustained the exclusive right of Mr. Wilder; and hence, in 1853, the former opposing party took a license from Mr. Wilder, paying him a royalty for the privilege of manufacturing such Safes. These celebrated Fire-Proof Safes are no longer made or sold by Silas C. Herring, his license to make and sell them having expired.



WILDER'S IMPROVED SALAMANDER SAFES.

The true Wilder's Salamander Safe is, beyond any question, the best Fire-Proof Safe in the world. Ever since its introduction, in 1843, it has been found at almost all great conflagrations, and has invariably sustained its reputation for being invulnerable to fire, even when, as has often been the case, *heated red hot;* as was the case in the Tribune Buildings, February 5, 1845, when after thirty-six hours subjection to the fiery element it was dug out red hot, opened, and books, bank bills, papers, etc., were found perfect, intact, and uninjured. Mr. Wilder's efforts from the outset of its existence have been one great cause of the pre-eminent popularity of this invaluable Safe, which in 1851, received the Gold Medal at the World's Fair in London.

A peculiar merit of the Wilder's Safe is its plaster of Paris lining, and is owing to the large amount of water this peculiar substance has locked up in its crystals. This is well understood by chemists, and is called the *water of crystallization.* No other known kind of earth or mineral can retain moisture so long as plaster of Paris, in an ordinary atmosphere; hence its superior merit as a lining for a Safe, to which it secures a sufficient interior moisture when exposed to the hottest fire from without; while at other times the moisture does not escape from the retentive plaster of Paris, and therefore does no injury, by dampness, to books, papers, etc.

The plaster of Paris linings of the Wilder Salamandar Safe encircles the contents of the Safe, and while cool and dry in an ordinary atmosphere, insures a sufficient engendering of vapor inside to protect any contents to whatever degree of intense heat the Safe has been or may be exposed.

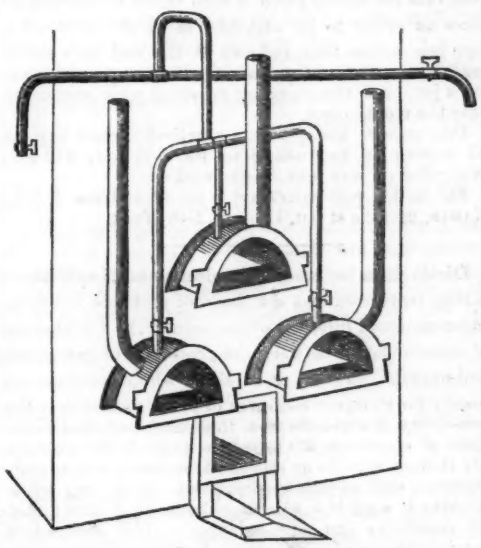
As a proof of the unprecedented popularity of Wilder's Salamander Safe among intelligent business men, we will cite the fact that *thirty one thousand eight hundred and nineteen* (31,819) have been sold in the United States up to May 18th, 1869; and *one thousand Safes per year,* of about 25 sizes, are now manufactured by this establishment. They have been subjected to the most severe tests, in almost every large fire which has occurred during the last seventeen years, and not one of the "Genuine Salamanders" has ever been destroyed.

The illustrations herewith, show two new styles of Safe, and having an improved interior cash box situated at the bottom also of the large cut and at the left hand upper corner of the small cut. These cash boxes, to inner Safe are surrounded with hardened steel plates, and the inner door is secured with cross bars of steel riveted together, not through and through, but each rivet only binds a section or series of bars, a portion only of the rivets appearing therefore on the outside or inside of the door. Each layer when removed exposes a new sreies of rivets. Hence will be readily understood how difficult it will be for burglars to enter such a Safe, secured also as it is with the best burglar proof locks known.

For further information apply to or address, "The Wilder Salamander Safe Company," depot, No. 43 Courtlandt Street, N. Y.

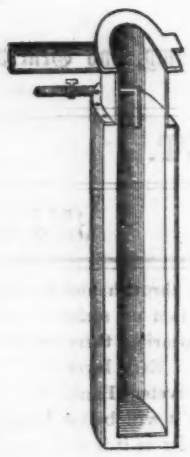
Hamar's Patent Anti-Carbonizing Process.

Let there be light! was the first command of the Creator, which is evidence that it is the greatest blessing of mankind. But as we only enjoy the sunlight one half of the day, it became necessary to meet the requirements of advancing civilization by providing other means of illumination. Thus, artificial light has become one of the greatest necessities of the present century, and much attention has been paid to the various means of producing it, but none can compare for economy and convenience with the common street gas-carburetted hydrogen. Therefore, everything which tends to the improvement of the quality, and the facility of producing it, is a step forward in the civilization of mankind. We are always willing to pay better prices for good gas, as the pleasure it affords amply repays us, while a flickering and smoky gas is injurious to sight and health and a trial to the temper.



The accumulation of carbon in the gas retorts has

always been a great nuisance to gas manufacturers, and many efforts have been made to remove it, as is seen by the innumerable and some very ingenious patents issued for that purpose; but strange to say all attention has been given to removing the accumulated carbon, but not a thought of how to prevent its accumulation and turn into use the otherwise lost carbon. This is a recent invention of Mr. A. HAMAR of Hungary, and consists in introducing jets of steam into the retorts while generating gas. The oxidation of the coke sets free a certain amount of hydrogen, which combines with the free carbon in the retorts, forming carburetted hydrogen, which is pushed off from the retorts by the surplus of steam, thereby increasing the quantity of gas



produced per pound of coal. The steam also purifies the gas, so that its illuminating power is considerably increased.

The apparatus is simple, as will be seen by the accompanying engravings, and can be annexed while the retorts are in use. A three quarter inch steam pipe is extended from the boiler along the top of the wall behind the stand pipes, the full length of the line of benches, provided with a stop-cock near the boiler and a waste cock on the other end of the pipe. With this pipe are connected half-inch pipes, which extend to and penetrate the mouth piece of each retort far enough to allow an elbow to be attached, in which is screwed a pipe ten inches long, reduced at the end by a sharp angle to a quarter of an inch, for the purpose of forming a jet. All the pipes are provided with stop-cocks near the mouth-piece.

This process has proven a practical success beyond all expectation, and owing to its simplicity will certainly find its way into all gas works.

For further particulars apply to or address Mr. A. HAMAR, 22 Pine street, Room 9, New York.

Distinction between Petroleum and Naphtha.—Strong representations are made of probable injury to the commercial interests of the country, by the absence of discrimination between the properties of petroleum and naphtha, on the part of those who discuss the necessity for stringent measures of precaution against the possibility of accidents from these articles. The petroleum of commerce is alleged, as regards its combustible character, to be as safe as the ordinary run of merchandise, such as tallow, provisions, wines, etc., while naphtha is a spirit so volatile as to be dangerous under all conditions and circumstances. The distinctions between the two have been, it is stated, clearly established by every kind of test, and anxiety is felt among our principal merchants lest one of the most extensive and rapidly increasing branches of our trade should, by the confusion of view that prevails, be transferred to other countries. It appears that the recent fire at Bordeaux was caused by naphtha only, and that not a drop of oil of petroleum was burnt there. In all the reported cases of damages from "petroleum," a similar mistake is contended to have prevailed. Under the circumstances, some authoritative view should evidently be attained as speedly as possible, since enormous as is the trade in this article, it is as yet only in its infancy, and we cannot afford, especially in the present state of business, that it should be driven by a misconception into the hands of competitors.—*British Trade Journal.*

Chemical Repertory.--No. 27.

APRIL 2, 1870.

Editor—HENRY WURTZ.

Editorial.

APOLOGETIC.

Probably the majority of our readers will find no fault with the necessary displacement of nearly all else from the present issue of the REPERTORY by the discussion of FARMER'S Theorem; this being a subject of special public interest at this time, and hence must have accorded to it a paramount importance. Still, it is due to other contributors to specify the reason why their articles are delayed. Among others, we have another communication, of a very practical character, from Dr. BUSHEE on *Lightning Rods*, and Dr. VAN DER WEYDE has also a continuation of the discussion of the grand question pending between himself and Professor WALLING regarding the existence of force independent of matter. For these we hope to make early room. The writer cannot resist the temptation to call the attention of well-wishing friends, who tried strenuously at the start to deter him from what seemed to them the Sisyphean task of converting this into a "live" scientific journal, to the present prospect. Through the kind help of other scientists, the burden becomes already clearly less, and the *up-hill* grade easier to surmount.—H. W.

NOTE.—RELATING TO THE MEMOIR ON FLAME-TEMPERATURES; IN THE REPERTORY No. 24, OF MARCH 2, 1870.

A premature and imperfect copy of the results here presented appeared in May 1869, in a privately printed memoir of ours on the "Hydrocarbon Process." In that memoir there occurred important errors which grew entirely out of the haste imposed upon us by other parties. And we take this occasion to acknowledge our obligations to Mr. W. A. GOODYEAR of San Francisco, for his early and friendly assistance in pointing out to us the errors in question, a service which at a later date we experienced in a like friendly spirit at the hands of Prof. JOHN LE CONTE, of the University of California.

B. SILLIMAN AND H. WURTZ.

FARMER'S THEOREM.

The Editor has not heretofore given his unqualified adhesion to the principle involved in the new mode of calculating photometric results, brought forward first by Professor SILLIMAN at the Salem meeting of the AMERICAN ASSOCIATION last summer, first given to the public in the columns of this REPERTORY (No. 19; December 2nd, 1869) and now known in Gas Circles as *Farmer's Theorem*. He has, indeed, repeatedly expressed the view, and takes occasion now to repeat, that he deems the whole problem to be one of so great complexity, and to involve so many variable functions, that a formula or rule, applicable to all cases, must necessarily be much less simple than the proposed theorem. It is to be observed, that the gentlemen who have introduced the subject to the public, ventured only to call it a "theorem," which means *a thing to be proved*, or tested. A merit that will doubtless be widely conceded to Mr. FARMER and Professor SILLIMAN in this case is in having awakened the attention of photometricians and gas-chemists to the glaring unreliability and inaccuracy of the rule in undisputed acceptation hitherto for photometric calculations, and the necessity for a complete scientific revision and investigation of the subject. This will, of course involve more time and labor than any one scientist, or even any ten scientists, can be expected to devote, at his or their own expense; and we trust that some of our large and rich Gas Companies may be liberal enough to institute at once such investigations, they being obviously the parties whose interest and duty to the public it is to put this matter straight, before the public.

We would add that it seems plain that the chief value of the communication quoted below from our London contemporary, is not in impugning the proposed theorem (to which an applicability must now be conceded, within limits that cannot yet be defined), but rather in the additional proof presented of the uncertainty, in fact almost worthlessness, in its *general* applicability, of *the present rule*. Mr. HUNT'S results, also, on examination, are by no means free from cases coming closely under FARMER'S rule (witness the first two candle-powers calculated from Experiment No. 3). It will be seen below that a new claimant, for priority of suggesting the new theorem, has come forward, whose claims we present just as they come to us.

HENRY WURTZ.

American Chemical News.

THE FARMER THEOREM OF ILLUMINATING POWER.

[From the *London Journal of Gas Lighting*, March 1, 1870.]

SIR: May I be allowed a small space in the columns of your Journal for the details of some experiments, recently made by myself, for the purpose of testing the accuracy of Farmer's theorem?

Experiments 1 and 2 were made with Sugg's "New London" burner, Nos. 3 and 4, with a 15-hole standard Argand. The same volume of gas was used in each separate experiment, although the quality of each volume varied.

No. 1.

Gas burn'g	3·04	c. f. per hour	gave	4·68	Candles, being the average of 10 observations in 10 minutes, corrected to consumption of candle.
"	4·05	"	"	10·12	
"	4·46	"	"	14·25	
"	5·05	"	"	16·48	

Here	$3·05^2$	:	4·68	::	$5·05^2$	:	12·91 candles.
	$4·05^2$	:	10·12	::	$5·05^2$	:	15·73 "
	$4·46^2$	:	14·25	::	$5·05^2$	:	18·26 "
And	4·47	:	14·25	::	5·05	:	16·13 "

No. 2.

Gas burn'g	4·43	c. f. per hour	gave	13·38	Candles, as above.
"	5·00	"	"	13·20	
"	5·34	"	"	16·98	

Here	$4·43^2$	:	13·38	::	$5·0^2$	:	17·30 candles.
	$5·34^2$	:	16·98	::	$5·0^2$	:	15·32 "
And	4·43	:	13·38	::	5·0	:	15·32 "
	5·34	:	16·98	::	5·0	:	15·89 "

No. 3.

Gas burn'g	3·13	c. f. per hour	gave	6·756	Candles, as above.
"	4·20	"	"	12·360	
"	5·00	"	"	16·420	
"	5·44	"	"	17·426	

Here	$3·13^2$	:	6·756	::	$5·0^2$	:	17·25 candles.
	$4·2·^2$	:	12·360	::	$5·6^2$	:	17·51 "
	$5·44^2$	:	17·425	::	$5·0^2$	:	14·72 "
And	3·13	:	6·756	::	5·0	:	10·70 "
	4·20	:	12·360	::	5·0	:	14·71 "
	5·44	:	17·425	::	5·0	:	16·01 "

No. 4.

Gas burn'g	4·85	c. f. per hour	gave	15·07	Candles, as above.
"	5·11	"	"	15·66	
"	5·29	"	"	16·42	

Here	$4·85^2$	:	15·07	::	$5·11^2$	:	17·73 candles.
And	4·85	:	15·07	::	5·11	:	15·87 "
	5·29	:	16·42	::	5·11	:	15·86 "

In all these results FARMER'S theorem fails to give the true illuminating value. The rule-of-three method of calculation gives very nearly the real value when the consumption is within certain limits (taking five feet as the standard), but is very wide of the mark the further the consumption recedes from the standard; and this, I think, agrees with the experience of most observers. The old 15 hole standard Argand seems to develop the light at low rates of consumption better than Sugg's "New London," although the latter is admitted to be superior at five feet consumption. This is one instance of the kind; may we not infer that a greater amount of attention bestowed upon burners for *different rates* of consumption, would have the effect of educing a higher illuminating power at those rates than is at present obtainable? Proof is first of all required that the gas is consumed in all cases under the most advantageous conditions; the exact ratio of increase of intensity could then be readily ascertained.

CHARLES HUNT.

London Gas-Works, Nine Elms, Feb. 25, 1870.

[At our request Mr. FARMER has made some critical examinations of these figures, and the following are his comments thereon.—H. W.]

MR. FARMER'S NOTES ON THE ABOVE.

Experiment No. 1.

The figures of Mr. Hunt under (No. 1) by Farmer's Theorem give—

Test No. 1—3.04^2 : 4.68 :: 5.05^2 : 12.91 candles.
" 2—4.05^2 : 10.12 :: 5.05^2 : 15.73 "
" 3—4.46^2 : 14.25 :: 5.05^2 : 18.26 "

Mean candle power 15.63. Difference from the standard 0.85 of a candle, or 5.4 per cent.

But Mr. Hunt has singularly omitted to calculate his first and second tests by the simple ratio. I obtain for the three tests.

Test No. 1—3.04 : 4.68 :: 5.05 : 7.77 candles.
" 2—4.05 : 10.12 :: 5.05 : 12.61 "
" 3—4.46 : 14.25 :: 5.05 : 16.13 "

Mean candle power 12.17. Loss 4.31 candles, or 35 per cent.

Experiment No. 2.—By Farmer's Theorem.

Test No. 1—4.43^2 : 13.58 :: 5^2 : 17.29 candles.
" 3—5.34^2 : 16.98 :: 5^2 : 14.88 "

Mean candle power 16.08. Difference from standard 0.79 of a candle, or 5.1 per cent.

By Simple Ratio.

Test No. 1—4.43 : 13.58 :: 5. : 15.32 candles.
" 3—5.34 : 16.98 :: 5. : 15.89 "

Mean candle power 15.60. Gain, .31 of a candle, or 2 per cent.

In test No. 3 the consumption of gas was 5.34 cubic feet, which is far too much for a perfect combustion, when the gas has a candle power of 15.29.

The new theorem here implies that the combustion with a consumption of 4.43 cubic feet was much more perfect than with either a consumption of 5.00 or 5.34 cubic feet per hour.

There were only three tests, including the test for standard of comparison, and none of them varying much from the normal consumption, consequently there was not much margin for comparison.

Experiment No. 3—By Farmer's Theorem.

Test No. 1—3.13^2 : 6.756 :: 5^2 : 17.24 candles.
" 2—4.20^2 : 12.360 :: 5^2 : 17.51 "
" 4—5.44^2 : 17.425 :: 5^2 : 14.72 "

Mean candle power 16.49. Gain .07 of a candle, or 4 per cent.

By Simple Ratio.

Test No. 1—3.13. : 6.756 :: 5. : 10.79 candles.
" 2—4.20. : 12.360 :: 5. : 14.07 "
" 4—5.44. : 17.425 :: 5. : 16.01 "

Mean candle power 13.62. Loss, 2.87 candles, or 21 per cent.

In the reduction of test No. 2 by simple ratio, there is an error of .64 of a candle, which I have corrected.

The consumption of gas, in test No. 4, in this experiment, was 5.44 cubic feet; which was equal to 16.42 candles when consuming five cubic feet per hour. Now the majority of testers will agree, that it is impossible to get as good results from this consumption as from five cubic feet, yet by simple ratio it does not seem to lower the illuminating power much; and in experiment No. 2, a consumption of 5.33 cubic feet even gave the best results.

The new theorem very plainly indicates that the burner and gas gave the best results with a consumption of 4.20 cubic feet.

Experiment No. 4.—By Farmer's Theorem.

Test No. 1—4.85^2 : 15.07 :: 5.11^2 : 16.72 candles.
" 3—5.29^2 : 15.66 :: 5.11^2 : 15.32 "

Mean candle power 16.02. Gain, .36 of a candle, or 2.3 per cent.

By Simple Ratio.

Test No. 1—4.85 : 15.07 :: 5.11 : 15.89 candles.
" 3—5.29 : 15.66 :: 5.11 : 15.86 "

Mean candle power 15.87. Gain, .21 of a candle, or 1.3 per cent.

In the reduction by the Farmer theorem, Mr. Hunt has omitted test No. 3, which I have inserted.

Test No. 3 had a consumption of 5.29 cubic feet, and according to the new theorem, there could not have been a perfect combustion, or no doubt the illuminating power would have been still higher than test No. 1 of 16.72 candles.

Conclusions.

In these four experiments, the Farmer theorem very plainly points out what the proper consumption should be for those burners and gases; namely about 4.50 cubic feet, and the further you get up or down from this quantity, the greater will be the error in the results.

Every gas, and every degree of consumption will require a suitable burner, if a perfect combustion and luminous development is required.

In conclusion, I have remarked, that all the mistakes and omissions that have been made in these experiments by Mr. Hunt, have been against the new theorem, which certainly might be construed by some into a supposition of prejudice against it.

William Farmer.

Manhattan Gas-Light Company,
18th Street Station, N. Y., March 19, 1870.

THE NEW CLAIM TO PRIORITY OF DISCOVERY OF THE NEW RULE.

[Some unessential passages in the following have been omitted.—H. W.]

Fort Wayne Gas Light Company.
Fort Wayne, Indiana, Feb. 14, 1870.

Professor Henry Wurtz.

Editor Chemical Department Gas-Light Journal.

Dear Sir: I notice in the January number of the *American Journal of Science*, Article 2nd, by Prof. Silliman, on intensity of gas flame compared with volumes consumed, he refers to a method of calculation suggested by Mr. Farmer of New York. Having a rather distinct recollection of a number of experiments on the same subject made in 1868, and of writing to Mr. J. R. Smedberg in relation to them and other matters, I send you a copy of a letter to him, dated Feb. 27, 1868.

I received no answer to the accompanying, nor to another, inquiring in regard to it. I made many subsequent experiments with "Farmer's Theorem," and found that in the main it was far more correct than the usual way of reducing, although cases would arise in which it seemed at fault, but several could be accounted for in other ways.

It is evident to any observer that this theorem will hold true for variations in gas consumption better than the sperm, especially if the latter is *much more* than the normal amount, as it is then plainly to be seen that light is being lost in unconsumed carbon. For my purpose, however, I have at present a capital quality of candle, and have in nine out of ten experiments succeeded in adjusting so near the normal consumptions, that the difference between using the direct ratio or the ratio of squares is very small, and in numerous cases nearly balance each other, as I have frequently three or four consecutive observations in which the sperm varies but 2 to 4 grains, and the gas less, from the normal.

By a curious coincidence I had compared the case in Bannister by Sugg, mentioned by Mr. Silliman, upon my first receiving the work. Of course Mr. Farmer is not deprived in any measure of the independent suggestion of this theorem, by my claim of having used it; but such is the fact, that I had used it two years ago, and wrote, as enclosed, to Smedberg about it.

You may be assured it is no easy matter in a place like this, to even keep up with the advancing tide of science, or be as they say posted, much less to originate or suggest anything new; therefore let us have credit for the little we do advance.

Yours in haste,
Henry H. Edgerton, Sup't.

(Copy of the letter to Mr. Smedberg.)

Office Fort Wayne Gas-Light Co.,
Fort Wayne, Ind., Feb. 27, 1868.

James R. Smedberg, Esq.

Dear Sir; Will you please inform me if you have ever, or has any one to your knowledge, ever suggested the reduction of photometrical observations to the normal consumption of candle and gas, by using the squares of the amounts consumed, instead of the ordinary way?

I have been some time engaged in experimenting, with a view to test the correctness of this way, and find that consecutive observations agree much better than by the old way, when the consumption varies much from the normal amounts. Have had our photometer moved lately into a room fitted with care, and where I can get a uniform quality of gas from the prover, and if the experiments agree as well as heretofore, I think I may assume this to be the more correct way of calculating observations. Have constructed a table which gives the result of the division of the squares of the quantities, which facilitates very much the calculations. If you have not already had your attention directed to this matter, please try it, eliminating all sources of error possible, and see how the observations agree.

Yours very truly,
H. H. Edgerton.

[Mr. Smedberg being now in California, there has not been an opportunity as yet to obtain his testimony regarding the above. Steps have been taken, however, to communicate with him. In the meantime no doubt can reasonably be held that we have here another of those extraordinary cases, so numerous in the history of scientific discovery, of independent travellers simultaneously pushing on in precisely parallel paths and arriving at identical stand-points.

The following remarks of Mr. Edgerton, from a letter more recent than the above, in reply to one from myself, in which I referred to the communication quoted above of Charles Hunt; will be found of interest in this connection.—H. W.]

Fort Wayne Gas-Light Co.,
Fort Wayne, Indiana, March 21, 1870.

Professor Henry Wurtz:

Dear Sir: Your letter received. You will confer a favor by making known my claim of having used Mr. Farmer's method of reducing photometric observations, although I concur with you that it is not capable of extended application for *extreme* variations. I only know and can substantiate experimentally, simply this, that whereas, by reducing observations by the ratio usually adopted great variations in candle power are observed; upon reducing the same observations by the method of squares, the variations in candle power are brought within quite narrow limits.

I think I could *devise* experiments apparently refuting this theory also; but the main question is—does it answer practically within certain reasonable limits to make observations agree. For instance, using a holder containing an unvarying quality of gas, and burning the same candle during four or five consecutive observations, with a variance from the normal of say from 4.8 to 5.3 cubic feet of gas and 116 to 130 grains for the candle, the maximum difference is .5 candle and variance from a mean, less than .25 candle. If such is the case, and I claim that in 8 out of 10 experiments it is, then is not the proposed manner of reducing the proper one *within those limits*, and how many observations *occur outside* them?

Your obedient servant,
Henry H. Edgerton, Sup't.

FARMER'S THEOREM AGAIN.

FURTHER IMPORTANT INVESTIGATIONS BY MR. FARMER.

In Sugg's "Gas Manipulation" (London, 1867) page 64, will be found the following results of an experiment designed to illustrate the unfitness of the simple rule of three for calculating the illuminating power of the gas, when using any other consumption than the normal amount.

The following tests have been corrected for five feet consumption:

1.—5 cubic feet—14.00 candles.
2.—4.9 " 13.78 " Loss, .22 of a candle.
3.—4.8 " 13.74 " " .26 " "
4.—4.7 " 13.30 " " .70 " "
5.—4.6 " 13.04 " " .96 " "
6.—4.5 " 11.93 " " 2.07 candles.

Mr. Sugg says: "The foregoing demonstrates two facts; firstly, that the Birmingham burner, even when burning the full quantity of five feet per hour, does not show the true quality of the gas; and secondly, the inapplicability of the rule of three, for estimating the light given in proportion to the quantity consumed. Otherwise the whole of the results would have been fourteen candles."

He says—"The quality of the same gas as exhibited by Dr. Letheby's burner, with five cubic feet consumption, and 120 grains of sperm per hour, was 15.50 candles."

The mean candle power of the last five tests is 13.158. Loss, .84 of a candle, or 6.4 per cent.

The same tests calculated by Farmer's Theorem.

1—5.0 cub. ft.—14.000 candles.
2—4.9 " 14.060 " Gain .06 of a candle.
3—4.8 " 14.312 " " .31 " "
4—4.7 " 14.148 " " .14 " "
5—4.6 " 14.191 " " .19 " "
6—4.5 " 13.255 " Loss, .74 " "

Mean candle power of last five trials is 13.99. Loss, only .01 of a candle. Test No. 3 showed most perfect combustion.

The following table gives the illuminating powers of Mr. Sugg's tests corrected for sperm only, and also the the fractional power each test requires, to raise it to the standard of fourteen candles.

2. 4.9^{3} : 13.504 :: $5.^{1.83}$: 14 candles.
3. $4.8^{1.47}$: 13.190 :: $5.^{1}$: 14 "
4. $4.7^{3.12}$: 12.502 :: $5.^{1.83}$: 14 "
5. $4.6^{1.8}$: 11.996 :: $5.^{1.86}$: 14 "
6. $4.5^{2.52}$: 10.737 :: $5.^{53}$: 14 "

I should say the 3rd and 6th tests are not reliable, as there cannot be any good reason given why they should differ so much from other tests, as the consumption is only one-tenth of a foot less than in the preceding test of either.

The 2nd, 4th and 5th tests fall a little below the 2nd power or square, the fractional powers for these being nearly the same, while the 6th is considerably more.

Trials with Grahamite* Gas.

The gas made from this West Virginia mineral was too rich to burn with the standard Argand burner, when consuming five cubic feet per hour, therefore I had to find the illuminating power by some other method.

1st. I mixed 80 per cent of 15.11 candle gas with 20 per cent. of Grahamite gas, and with a consumption of

* For an account of this remarkable West Virginia mineral, by the Editor, see the Repertory No. 15, October 2. 1869.—H. W.

five feet per hour, found the candle power to be 18.44. therefore

$$\frac{18.44-15.11\times 80}{20} + 18.44 = 31.76 \text{ candles.}$$

2nd. I mixed 78 per cent. of 13 72 candle gas with 22 per cent. of Grahamite gas, and with five feet consumption found the candle power to be 17.532, therefore—

$$\frac{17.532-13.72\times 78}{22} + 17.532 = 31.05 \text{ candles.}$$

3rd. Grahamite gas burnt with a Scotch tip and five cubic feet consumption, gave 30.01 candles.

4th. Grahamite gas, with standard Argand burner, and 4.056 cubic feet consumption, gave 19.24 candles, when corrected for sperm only. This, calculated for five cubic feet consumption

By Farmer's theorem, is 29.32 candles.

By simple ratio, is 23.71 candles.

No doubt the cause of loss in candle power here was too great consumption of gas.

5th. Grahamite gas, burnt with standard Argand burner and 3.876 cubic feet consumption, gave 18.66 candles; when corrected for sperm only. Calculated for five cubic feet consumption

By Farmer's theorem, 31.05 candles.

By simple ratio, 24.07 candles.

6th. Grahamite gas, burnt with standard Argand burner and 3.828 cubic feet per hour, gave 18 79 candles, when corrected for sperm only. Calculated for five cubic feet consumption

By Farmer's theorem, 32 05 candles.

By simple ratio, 24.54 candles.

RECAPITULATION.

Mean candle power of 1st and 2nd tests found by mixing with poor gas—31.40 candles.

Mean candle power of 4th, 5th and 6th tests found by Farmer's theorem—30.80 candles.

Mean candle power of 4th, 5th and 6th tests found by rule of three—24 10 candles.

Candle power of 3rd test found by burning five cubic feet with Scotch tip—30.01 candles.

William Farmer.

Eighteenth Street Station,
Manhattan Gas-Light Co., March 21, 1870.

[The following two items have been crowded out of the last two issues—H. W.]

The Great Eclipse.—*The Supposed Polarization of the Corona.*—Prof. Edward C. Pickering, who communicated directly to the Repertory (No. 14, Sept. 16, 1869, page 85) his discovery that the light from the corona contains no *polarized* light, of which it had been previously believed mainly to consist; whence it follows that the corona shines by *its own*, and not by *reflected* light; and whence it is inferred that this hitherto mysterious apparition is probably of a nature similar to the Auroræ of our earth; has sent us a further paper (in print) on the subject, which we unfortunately cannot reproduce, as it contains cuts illustrating his polariscope. The following note, however, which he appends, is altogether new, and of the utmost importance, as confirming his discovery beyond cavil.—H. W.

"Note.—Since writing the above I learn from Prof. F. H. Smith that an excellent Arago's polariscope was used at Eden Ridge, Tenn., in observing the eclipse. The result agreed with mine, namely, that no traces of polarization could be detected in the corona with this instrument.—E. C. P."

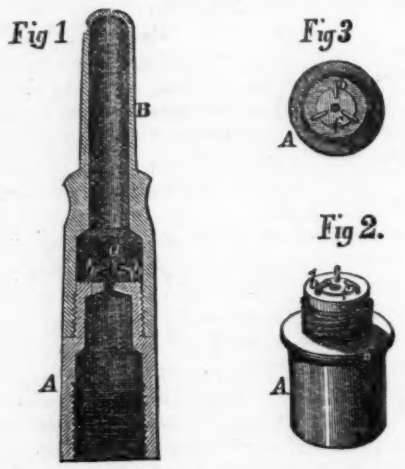
The American Gas-Light Journal and Chemical Repertory. Edited by Prof. Henry Wurtz.—The well-known ability of the editor has recently called a great deal of attention to this journal, and no one who has attentively perused it can have felt himself disappointed. The Chemical Repertory is especially rich, and merits particular attention, as it is compiled with great care by Dr. Wurtz, and conveys much new scientific matter in a very readable shape, with the added value of the editor's learned criticisms and corrections.—*Jour. Applied Chemistry, Jan.* 1670.

A Speaking Machine.—Prof. Faber's speaking machine is to be exhibited at Hamburg during the continuance of the International Horticultural Exhibition. It is said to articulate various words, and even to answer questions and simple sentences, with wonderful distinctness. This is by no means the first invention of the kind that has been exhibited. Wolfgang von Kempelen, the inventor of a chess automaton, who was born at Presburg in 1734, and died at Vienna in 1804, both constructed a machine of the kind, and wrote on the subject. The machine about to be exhibited at Hamburg is, however, more perfect than any previous invention of the kind.

Gill's Patent Gas-Burner Regulator.

We herewith illustrate an improved method of regulating the flow of gas to a burner; the equalization of the supply preventing, as is well understood, the unsteadiness of the light sure to arise from variations in the pressure of the gas. In the engravings, Fig. 1 is a vertical transverse section of a burner furnished with the regulating device. Figs. 2 and 3 are respectively side and plan views of the lower part or socket of the same.

A indicates the lower or socket portion of the burner, on the top of which is a minute orifice to permit the overflow of the gas to the tip above. The upper part of the socket is threaded externally, and has screwed upon it the tip, B, in the lower part of which is the chamber, *a*, immediately over the flat top of the socket. Laid upon this latter is a disc *f*, which when depressed upon its seat, or, in other words, upon the top just mentioned of the socket, covers the orifice in the latter.



This disc is, however, capable of a slight upward movement. During such movement it is guided and kept in place by wire guides, *b*, fixed in the top of the socket at points outside the circumference of the disc. The chamber, *a*, is of such size that a space is afforded between its sides and the edge of the disc, arranged concentrically within it, so that when the disc is raised there may be room for the escape of the gas upward around the just-mentioned periphery of the disc.

The operation of the device, which although at first glance something of a paradox, is founded upon a correct philosophical principle, is as follows: The gas, in passing through the orifice in the top of the socket only very slightly lifts the disc, *f*, so as to pass by or around its edges to the tip, A, any considerable lifting of the disc being checked by the gas as it is liberated or escapes around the edges of the disc into the chamber, *a*, superinducing a downward pressure upon the latter, which keeps it balanced against the upwardly exerted force of the current of gas issuing below it from the orifice in the socket. Consequently the greater the pressure of gas from the orifice, the more will the disc be depressed, and the more will the space through which the gas issues to the chamber, *a*, be contracted to diminish the size of the current in proportion as the pressure thereof increases—the pressure of the gas supplied to the tip, A, being by this means equalized or rendered uniform.

This burner is one of those inventions founded upon a novel and entirely distinct principle from anything of the kind. The inventor has been the first to sieze upon the happy idea of making useful a peculiar principle in natural physics, whereby the flow of gas through a burner is automatically regulated by its own pressure upon a valve, so that only just the proper amount of gas is permitted to pass, to insure perfect and complete combustion, and thus obtains the full amount of light without waste or loss, which it is possible to obtain. Its operation will be a curiosity for the study of the amateur in natural science. Practically, it is simple, cheap, and efficient, producing a clear, steady light, and should be, and we doubt not, will be popular with all gas consumers who study economy and convenience. And for these reasons we predict for the patentee a profitable return for his ingenuity and enterprise.

For further information address Mr. H. E. Stocking, 496 Third Avenue, New York; also Mr. E. Sanderson, 22 Pine Street, Room 10, New York.

New York Society of Practical Engineering.

This organization held its usual monthly meeting on the evening of Wednesday, March 16, in the Cooper Union Building, James S. Whitney occupied the chair, and Dr. A. W. Hall read a paper on "Water Meter Construction," the regular subject of discussion.

The statement made ten years since by a leading New York City Daily, that water meters were likely to become of more importance than gas meters, has held true with regard to inventors, who have produced hundreds of water-measuring devices, but not to the general public, which has refused to afford any considerable degree of approval to any of them. Meanwhile more than one hundred cities with water works, costing in the aggregate at least one hundred millions of dollars, permit water to be wasted to the most inordinate extent. The supply to each adult in the city of New York is upwards of sixty gallons per diem, but notwithstanding this, in a summer drought we have to forbid the use of water for laying the dust in the streets.

Dr. Hall alluded to the difficulty of overcoming the numerous problems presented in the construction of a perfect water meter. Each of those hitherto in use having some prominent defect to counterbalance its merits. Cheap meters can be made on the screw or turbine principle, of which the Siemen's meter is the most familiar example, but this is open to the objection that a portion of the water flows between the perimeter of the screw and its cylinder, and consequently fails to be registered. Also, on the rotary plan, but these possess a similar drawback, as the water leaks past the rotary piston, just as steam does in a rotary engine; also, upon the diaphram system, but the material of which the diaphram is made disintegrates by the constant movement of its particles upon each other, and although all kinds of material, from elastic india rubber to thin sheet metal has been tried, the difficulty has not yet been overcome. Friction and expense in piston meters are well known objections, while dumping meters cannot be used except at outlets, which would necessitate a meter at every faucet; this would be too expensive unless the device were much cheaper than any dumping apparatus yet introduced.

Dr. Hall proceeded to mention a series of experiments with a meter on the proportiona e plan, which he at one time believed to be the best fitted to meet all the requirements of a complete and efficient meter. This system consists in brief, in dividing the water into two parts or streams, one large and the other small, and bearing a definite proportion to each other—for instance, as two to a hundred. The smaller stream being measured serves as an index to the volume of water passed in the larger one. The apparatus experimented with had too valves actuated simultaneously to divide the water, and the smaller stream was measured in a small dumping meter suitably attached and furnished with recording mechanism. It was found that the proportion or ratio between the two divisions of the water did not remain constant under different pressures. This was remedied by an ingenious pressure regulator, but further and irremediable difficulty was experienced from the settling of minute particles of dirt in the orifice of the smaller valve, which of course either stopped the smaller stream entirely or changed it from its normal and requisite proportion to the larger one. There was also the incidental drawback that an extra pipe was required to carry off the water from the measuring part, and the expense of this made the cost of the water too great. For these reasons after two years of careful experiment and an expenditure of two thousand dollars, the writer had been compelled to give up the proportionate system except for faucet meters, for which he believed it to be quite available.

Having arrived at the above conclusion, Dr. Hall said that he had turned his attention to screw meters, with a view to obviate the acknowledged defects of those hitherto made. He exhibited a model and described the construction of a meter devised by himself with this object. In order to avoid friction upon the bearing of the screw spindle, the cylindrical body of the screw was made hollow, so that the whole taken together would have about the same specific weight as the water, and being buoyed as it were, would exert no presure on the bearing. Leakage around the perimeter was provided against by attaching a cylindrical case around and upon the screw and rotating therewith, the flow being directed within this case. Avoidance of flow through the space between the case and the outer shell is provided for by making the passage to this space so long and sinuous that, in taking the easiest way the water would be caused to pass wholly through the screw.

Mr. Frank G. Johnson, of Brooklyn, briefly addressed

the meeting with reference to screw meters, explaining one that some years since he had tested with good results, to the extent that four million gallons flowed through a single meter. This apparatus was composed of a number of turbines arranged at intervals upon a shaft, within the cylinder, fixed to the latter and situated alternate with the turbines, were spiral ways that threw the water in constant play at right angles to the faces of the turbine blades. This of course rotated the shaft which was connected with the recording devices by a worm on its upper end, scoring into a worm-wheel. A proportionate meter has been made with a spiral or turbine motor, a small screw meter constructed as above being adapted to measure the flow of the smaller proportioned stream.

Correspondence.

[Correspondents in all cases should sign their communications with their names and address in full, not necessarily for publication, but as a guarantee of good faith.—EDS.]

Gas Matters in Cleveland, Ohio.—In Favor of Clay Retorts.

PEOPLE'S GAS-LIGHT CO.,
CLEVELAND, O., March 13, 1870.

Messrs. Editors: Knowing by your valuable paper that any information relative to gas matters was interesting to you, I will first give you a statement of our success the past year. Our consumption was 15,462,421 cubic feet, and amount of coal charged 3,482,750 lbs., or 741 tons, 750 lbs., of 2000 lbs. Our yield through out the year averages 4 49-100 cubic feet to pound of coal. The coal we use we obtain from the Cleveland and Pittsburg Coal Company; it is the best gas coal we have found in this market. We laid about three and one half of main the last year, and have now in circulation 13 42-100 miles; number of consumers, 643; number of street lamps, 358. Our reports to stockholders the last year were very satisfactory, giving them a good dividend for this our second year of existence.

Now I want to say something to you and our friends in gas matters, relative to clay retorts. I saw a communication from the Northern Liberty Gas Co., saying that their experience with clays was that their durability was not over eight months. Now, I hold that a good bench set up in good style, of good material, will last from three to five years, if it is taken care of; but if you allow your men to draw or shut dampers, get up and let down heats at their discretion, they will not last over the eight months, *if they are good material.* We have a bench of fives that has been in constant use twenty-eight months, and I consider them good for at least one or two years more. We obtained our retorts, tile, etc., from J. K. Brick. As regards the arches I consider them good for fifteen or twenty years. I am a strong advocate for clay retorts, and could not think of returning to iron, as long as we get results such as we do. Hoping I have not trespassed on your time. If this is acceptable I shall give you another dose upon my ideas in general, relative to the Convention, condensation, etc. I remain yours truly,

SAMUEL A. ALLEN,
Engineer and Superintendent.

[The above correspondence is instructive and interesting, and will be the more so, in connection with the correspondence advocating iron retorts, signed "Machinest." The subject is well worth discussing, and the more light we can get upon this matter, the better able will we be to solve the problem—which is best, iron or clay retorts.—EDS.]

Some Objections to Clay Retorts—In Favor of Iron.

OHIO, March 9, 1870.

Messrs. Editors: I am hopeful that the question of Clay vs. Iron Retorts will be so fully sifted and reported on, that engineers of *small* gas works may have the benefit of each other's experience, in deciding which to use, and if coupled with the mode of setting, the account of each would help to make a valuable record. Twice have I given up iron for clay, but shall return to iron, although ready to admit their good qualities. 1st. They are durable. 2nd. They can be made to produce largely, and 3rd. Their first cost is less. This in part corroborates Scott Siddon's puff of his wares, and Mr. P. Pebbles article in your issue of March 2nd, but I differ with Mr. P. on the question of the accumulation of carbon, and other matters. My coals are kept in a good stone cellar, one side of which is open arches, the air has free play and they are dry. The tar is drawn from the hydraulic main until the gas can hardly be noticed in passing, yet the retorts choke with carbon *rapidly*, requiring cleaning every seven or eight weeks at most, and when the heats were splendid, making 10,000 feet per pair per day; they choked in four weeks. And I differ with him as to the cause, and do not see that water in the coal can increase the difficulty. Mr. Pebbles certainly cannot show that water will produce carbon. He must know that it (water) is used to remove the carbon.

My objections to clay are—the accumulation of carbon; the *never ending* leakage by cracks; the inability of removing them for repairing the bench; the largely increased amount of fuel required. The last item alone will pay the difference, in my judgment, and yet I have never seen it noticed.

I have used Covington, Cleveland, and Kreisherville retorts, and have come to the conclusion that the advantages do not compensate for the drawbacks.

Yours truly,
MACHINIST.

About Exhausters—In Favor of Clay Retorts.

496 PEARL STREET, NEW YORK,
March 10, 1870.

Messrs. Editors: Since writing the article over my name, relative to the use, and I may say abuse, of the Exhauster, I have noticed two communications questioning my views on the subject. Allow me to say such views are not abstract theories, but, on the contrary, are the practical results of working clay retorts for twenty-five years.

From communications I have received, there appears some little misconception of my previous article. I wish it to be understood that I do not condemn the use of an Exhauster, if properly used; that is to say, that there shall always be a pressure of say, two inches in the retort. The pipe carrying away the gas from the several benches, after passing the hydraulic main (always providing it shall be perfectly sound), may be, with great advantage exhausted, even to one inch vacuum. The article was, and is intended to warn gas companies and their superintendents, against the dangerous practice of taking away the seal from the hydraulic, or lowering the water in such to within half an inch, and then working the Exhausoer to a vacuum. The works I spoke of such practices exist, and the arrangement are of such a character as it will not surprise me to hear that the works are at some time blown up, by the folly now in existence; for instance, at one end of the hydraulic main a two-inch pipe is inserted nearly at the bottom; below the dip pipes attached to this pipe is a double elbow which can be lowered or elevated at the pleasure of any man on the works, who chooses to be at the trouble to do so. And I have seen with half inch pressure on the Exhauster, the gas rush down the stand pipes and fill the retort house—that is loss to the company.

But with such arrangements what would one and a half inch vacuum do? Spoil the gas it is sure to do; but it is quite probable that some day it may *blow* the works and all concerned into the river.

Having so far qualified the position I have taken, I propose to speak of my experience with clay retorts, without the Exhauster. In doing so I will give data, as well as my memory serves me. In the year 1837 I first entered, and have ever since followed the business of Engineer and Manager of Gas Works in England, paying special attention to the manufacture. In 1849 I first used clay retorts, when by many wise heads they were considered a foolish experiment, and even at this time there are people who condemn their use. I must in this place say that it is entirely due to the use of clay retorts, that the English gas companies are enabled to sell their gas at three shillings per 1000 feet, and at the same time pay good dividends; and I can only say that with such excellent fire clay and retorts that I have seen in this country, the same results are attainable, and I have no hesitation in saying that a clay retort, properly set, is fifty per cent better than an iron one. 1st. Its cost is only about half an iron one. 2nd. It will last four times as long in good work. 3rd. It will do at least 25 per cent. per day more work, and it takes a great deal less fuel to heat it. With this digression allow me to say, that from improper workmanship, my first introduction to clay retorts was not over satisfactory, but having them reset, got rid of the trouble. I worked them for seven years, without Exhauster, and moved to a large works—Grantham in Lincolnshire, where there were all iron retorts, the Consulting Engineer being dead against clays—in three years I had not an iron retort in the place, still I had no Exhauster at this works. I was lifting a gasholder that gave six inches pressure. They were then introduced through my success and recommendation to Nottingham, the works of the Consulting Engineer. I also introduced them at Malton Mowbray, where they are still used, without an Exhauster. Four years after I had charge as engineer and superintendent of a large works (Reading, in Berkshire) where there were the same iron retorts; this was in 1860. I changed the whole to clay, with such decided success, that the stockholders voted me a very handsome gratuity; still I used no Exhauster. About the year 1862 the subject arose in the English *Journal of Gas-Lighting* (where any one may see my opinion), about June of that year, and I have had no reason to alter them. In 1864 I fitted up a works at Aldershot with clay retorts: here I had a six-inch pressure gasholder, and had no difficulty. In 1866 I fitted up a works in Sweden (then using iron retorts) with clay retorts, and to none of these works have I fixed an Exhauster, neither is there any now.

Your correspondents must, I think, therefore, allow that it is quite possible to use clay retorts without Exhauster. I have found these results from clay retorts set by myself, which can be proved by the Reading Gas Company's books—wear of retorts, ⌓ shape, three years; gas made per rĕtort 15 x 13 in. 8 feet 6 in. long, per day 5000 feet from second class coal; yield per ton 10,500, or about 4.75 per lb., fuel 30 per cent.; loss by leakage, condensation, etc., about 15 per cent.

With reference to the strength of the retort it is patent to all who have used them under both circumstances, as the pores or fractures become filled up with carbon. I may say, in conclusion, that I am ready to prove what I have written or stated, by undertaking any retort setting or other alterations gas companies may favor me with.

Respectfully yours,
JOHN KEELING.

Refutation of an Attack on Gas Companies Concerning their Meters.

LOUISVILLE, March 17, 1870.

Messrs. Editors: Enclosed I send you an article that has appeared in several newspapers, and while I think the author's motives were good, I must say that the same amount of misrepresentation could hardly be crowded into the same space, on any other subject. Now, while I do not feel called upon to defend gas companies, I do feel a desire, and with your permission, will say a few things in vindication of a numerous and much abused class of fellow mortals—namely, the gas men.

Without attempting a description of the gas meters, I will say the principle is the same in all, whatever be the variation in form or details of construction, and to find fault with it is easier than to improve it; and I may safely say that it enjoys the confidence of all who have taken time and pains to make themselves acquainted with its movements. And as there are some who still have misgivings concerning its capabilities, let me advise them to devote one-fourth of the time to an examination of its merits, which they have spent in searching for defects, and all their objections will be satisfactorily answered and their doubts entirely removed. Many persons abuse it, and almost always for its honesty. Those who think or speak slightingly of the gas meters, may with propriety be asked in what other department of trade or manufacture, goods are measured with anything approaching to the accuracy with which gas is measured. In other branches of trade, whatever may be the accuracy of the instruments, or the care of those weighing or measuring, whether in large or small quantities, are interrupted processes; and consequently there is waste and liability to error. The measuring of gas is not an interrupted process. The machine performs the whole of the work, and keeps a correct record of its own doings. Although each of the chambers of the meter is filled in succesion, they are so contrived that the current of gas flows continuously, faster or slower, as may be required, and the most vigilant observer would not be able to determine the moment when one chamber was full and another empty; and yet the successive filling and emptying of each is more perfect than in measures used for articles which are many times more costly. Think for a moment of the work the meter does, and what is the value of the commodity it measures, comparing it bulk for bulk with others. Take coal oil at twenty cents per gallon, as one example, and whisky at two dollars per gallon as another; 1000 cubic feet of the former cost $1,496, and the same quantity of the latter $14,960. Neither of these articles is measured to the dealer or consumer with anything like the accuracy of gas, which we will assume costs the consumer $5 per 1000 cubic feet, or a little less than 67 cents for 1000 gallons.

But without presuming further on your patience and space, I will say in conclusion, however much the gas man may regret the unjust charges so frequently made against him, he has nothing to be ashamed of in his

business, when tried by the rules and standards governing other pursuits in life, and I think universally courts investigation rather than otherwise. R.

(*Article referred to in above letter.*)

CONCERNING GAS MATTERS.

The citizens of Port Huron, Michigan, are about to indulge in the luxury of a gas company. In granting a charter to a company the city authorities seem disposed to go slowly and protect the citizens so far as possible, from the proverbially unwholesome greed of a gas monopoly. A prominent citizen of Detroit through the columns of the *Press*, thus enlightens the Port Huronites on the subject of gas meters.

In the first place meters are used to designate or measure the gas burned. This operates as a blind. An expert can so change a meter that it will register twice the amount of gas passing through it, or not half the amount. In the second place, it has been asserted on good authority, that the manufacturers of gas meters cannot sell their work unless the meters are so made as to register 20 or 25 per cent. in favor of the gas company—that is, that amount more than is actually passed through the meter. It is said this can be done without detection, except by scientific test. All gas companies furnish their meters to their customers. They allow none others to be used, hence if an honest manufacturer should offer meters for sale to gas consumers, they could find no buyers.

Another thing is not generally known by consumers. The poorer the quality of the gas the more will burn to produce a given quality of light, and the quality can easily be adulterated in the manufacture, and its passage through the pipes and mains, and not readily be discovered by consumers.

To show how perfectly unreliable and useless gas meters are, I will state that in cases where consumers thought they were charged too much for gas—they have sought to economize by shutting off early, and not lighting more than one half of their burners. The next month the bill would come for virtually the same amount. In other cases where other light has been substituted unbeknown to the gas company, and the gas not burned a moment during the month, the bill would come in for as much as when it was burned with all the burners! I do not assert the bill and the amount of gas charged for would be exactly the same, but substantially the same—perhaps a few hundred feet, more or less, charged from the previous month. These charges are supposed to be made from the amount registered on the meter and taken off each month by an agent of the company. The only thing that generally changes a gas bill is a change in the seasons, when the evenings are longer or shorter, and gas companies seem to think it would not do to keep the bill the same the year round. After people go to the expense of getting in gas fixtures, and enjoy the luxury of gas light over all other kinds in its convenience, they will submit to a good deal of extortion, rather than abandon it, or fight a gas company, who tell you to "pay up" as they present the bill, or they will "shut off" instantly. The amounts, perhaps not large, are generally paid with the belief that there is a fraud in it. A gas company is generally a monopoly, and the people at its mercy, after once in its hands. I know nothing of the company forming in your city, but only give information of a general character, where proper restrictions are put upon them in the start. There is no doubt that gas can be manufactured for $1.50 per 1000 feet, with a better profit than one business in twenty will pay.—*Louisville Commercial, March* 2.

Recent American Patents.

Pertaining to Gas, Water, Etc., from the 12th to the 26th March, 1870.

100,489.—Faucet.—F. M. Bachman and Samuel Ricker Fredericksburg, Pa.

100,497.—Desulphurizing Ores.—Elizabeth A. Burns, Meadow Lake, Cal.

100,512.—Steam and Water Separator for Steam Engines.—C. E. Emery, Brooklyn, N. Y. Antedated Feb. 18, 1870.

100,531.—Steam Generator.—G. P. Hunt, United States Navy.

100,534.—Carbureting Air.—Charles Lawrence, Cincinnati, Ohio.

100,559.—Gasometer.—Thomas F. Rowland, Greenpoint, N. Y.

100,561.—Self-Closing Faucet.—Carl Schultz and Thos. Warker, New York city. Antedated Feb. 21, 1870.

100 567 —Balanced Water Elevator.—W. L. Thomas, Wadsworth, Ohio.

100,634.—Check for Gas Burners.—J. H. Jennings, New Bedford, Mass.

100,648.—Water Wheel.—Samuel Martin, York, assignor to himself and B. F. Manifold, Lower Chanceford, Pa.

100,653.—Lamp Burner.—Rufus Spaulding Merrill, Cambridge, assignor to himself, William B. Merrill, and Joshua Merrill, Boston, Mass.

100,668.—Manufacture of Illuminating Gas.—A. C. Rand (assignor to William J. Nichols, Alden B. Rand and Richard H. Brown), New York City.

100,684.—Gas Machine.—Theodore G. Springer, St. Louis, Mo.

100,706.—Cement to be Used in Sewers and Drains, and for Constructing Flues and other Parts of Buildings.—J. Kleckner, Mottville, Mich.

100,721.—Faucet.—James Bulger, Port Sherman, Mich.

100,725.—Enamel and Clay Gas Retorts, Burners, Tiles, etc.—D. W. Clark, Chicago, Ill.

100,726.—Pipe Joint.—R. B. Coar, Jersey City, N. J.

100,731.—Machine for Drilling and Tapping Gas Fittings.—R. T. Crane, Chicago, Ill.

100,732.—Turbine Water Wheel.—E. F. Crocker, Niles, Mich. Antedated March 2, 1870.

100,736.—Apparatus for the Production of Ozone.—C. F. Dunderdale, New York City.

100,737.—Apparatus for Forcing Air into Carbureters on Railroad Cars.—C. F. Dunderdale, New York City.

100,746.—Combination Water Wheel.—John Fuller and Herbert Fuller, Lockington, Ohio.

100,773.—Apparatus for Lighting Gas by Electricity.—W. H. Kelly, New York City.

100,774.—Vapor Burner.—Isaac Kling, Seymour, Ind.

100,785.—Governor for Steam Engines. — Thomas Moore, Brooklyn, N. Y.

100,807.—Vapor Burner for Cooking or Heating.—H. S. Saroni, Baltimore, Md.

100,814.—Steam Engine Slide Valve.—A. J. Stevens, San Francisco, Cal. Antedated March 5, 1870.

100,841.—Steam Engine.—John S. Barden, Providence, R. I.

100,847.—Steam Engine Governor.—Horace Boardman, Port Richmond, N. Y.

100,874.—Still for Distilling Hydrocarbons.—J. B. Edwards, North Greenbush, N. Y.

100,920.—Water Wheel.—A. F. Murray and Harry Green, Moline, Ill.

100,930.—Vapor Burner.—Henry Schminke, Baltimore, Md.

100,942.—Water Wheel Regulator.—H. D. Snow, Bennington, Vt. Antedated March 11, 1870.

100,953.—Manufacture of Rosin Oil.—Joseph Treat, New York City.

REISSUES.

3,872.—Apparatus for the Manufacture of Gas.—J. W. Nichols and A. C. Rand (assignees, by mesne assignments, of L. D. Gale, assignors to W. J. Nichols, A. B. Rand and R. H. Brown), New York City.—Patent No. 26,028, dated November 8, 1859.

3,875.—Water Wheel.—William Foos, John W. Bookwalter, Mary A. Leffel, Springfield, Ohio, and Lamar Foos, New Haven, Conn., assignees, by mesne assignments, of D. K. Kraatz.—Patent No. 20,921, dated July 13, 1858.

The Beton Agglomere.

This new building material, which has been used extensively in Paris in the construction of foundations sewers, and aqueducts, originated with Mr. Coignet, a French engineer, who began his experiments about ten years ago. It is composed of about five parts sand to one of lime, and where a rapid setting is desired a small amount of cement is added—say about one quarter the quantity of lime. The mixture is ground and worked as nearly dry as possible. It is not molded simply like ordinary artificial stone, but it is placed in the mold in thin layers and subjected to the action of heavy rammers. When a layer has been long enough under the rammer, its surface is scratched, similar to a wall when being prepared for the second coat of plastering, and the next layer is turned on and subjected to similar treatment. It is claimed that by this process an excess of water is eliminated which acts unfavorably in the setting of mortar, and that as the bulk is diminished there is developed a marvelous increase of strength. That the material when properly prepared possesses strength can scarcely be doubted. The span of the basement arches of the Paris barrack is 18.3 feet; the floor at the corner of the arch being about nine inches thick. One month after the completion of one of these arches it bore a weight of 48 tuns upon a compass of ten or twelve feet.

Although the *beton* has been used to a very considerable extent in Paris for the construction of sewers, and there are instances where a house, and even a church, have been built of it, still it is hardly to be expected that it can come into general use for such purposes. The material might be much cheaper than stone, but a great variety of patterns and of machinery would be required so that nothing would be saved. But the *beton* is certain to prove of value in the construction of monolithic foundations, and for this it is peculiarly adapted to the wants of our western builders.—*American Builder's Journal.*

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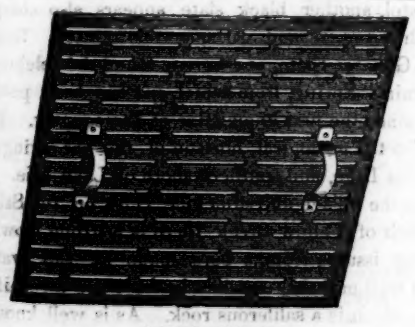

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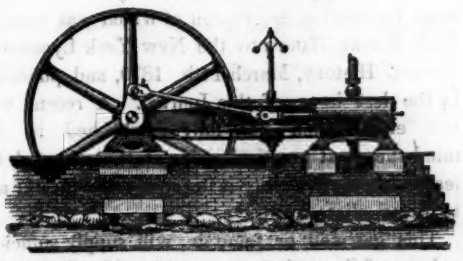

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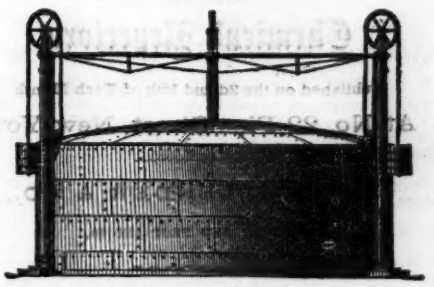

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[NOTE BY PROFESSOR WURTZ.—Contributions and items for which I am, as a Scientist, individually responsible, will have attached my full name or initials.—H. W.]

SATURDAY, APRIL 2, 1869.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of those subjects a pleasure, or a profession.

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THE BEEBE GAS WELL, ONTARIO CO.

This remarkable outburst of natural gas situated in West Bloomfield, Ontario County, New York, a most interesting description of which was read by Prof. HENRY WURTZ to the New York Lyceum of Natural History, March 14th, 1870, and published in the last issue of this Journal. A recent visit and examination has fully established in our mind the great practical valne of this gas, and the feasibility of conveying it in pipes to Rochester and to intermediate towns.

This gas well, or fountain, will supply sufficient volume of Gas to light two cities like Rochester; but inasmuch as it can be afforded at a low price, it will, doubtless, be employed for heating purposes, as a substitute for coal or wood, with great advantages in cleanliness, convenience and economy. But more than this, the gas can be used not only as fuel to raise steam for steam engines, but in the more simple and entirely safe Gas Engine, now being much used in European cities and here also. It will supersede steam, and afford a better, more convenient and cheaper motor.

Indeed, these remarkable advantages, with its other natural superiority, should make Rochester the model city of the world. We understand several of the heaviest capitalists of Elmira have purchased the gas well property, and have organized a company to carry out the ideas above hinted at, immediately.

Prof. WURTZ gives in another column of this issue most important additional information relating to the illuminating power of the gas, and its geological source.

A PRACTICAL APPLICATION OF FARMER'S THEOREM.

THE CANDLE POWER OF THE BEEBE GAS-WELL.

By some mistake, the *result* obtained, in the rude experiment made on the ground, for the candle-power of this natural gas, was *omitted* from my account of the subject in the last REPERTORY (March 16). The sentence omitted should come in after the words "maximum of light," 13th line from bottom of the first column of the article, and should read: "The result was between 5 and 6 candles." With an Argand burner, of the pattern in use for testing by the MANHATTAN COMPANY in this city, it would doubtless show at least seven candles. The burner which I used in making this test was the best one I could obtain on the spot, and was of the batswing pattern, with "lava" (steatite ?) tip, purporting to burn five feet per hour under an ordinary flow and pressure. In order that I might be enabled to form at least an approximate judgment, on my return to New York, of the real illuminating value of the gas of this well, I took much pains, when testing it with this burner, to reduce the flow and pressure (which I effected by passing the gas through a glass tube closely stuffed with cotton-wool, so adjusted that I could compress it more or less) just to the point at which the flame began to *flicker*, which I found to correspond about with the maximum of light. Since making my communication to the LYCEUM, as printed in our last issue, I have had an opportunity, at the photometric rooms of the MANHATTAN COMPANY in Eighteenth street, to make some experiments on this same burner with the street gas of that Company, the density of which will average about 0.45, while it will be recollected that the gas from the well ranges as high as 0.7. The MANHATTAN gas, flowing from this burner under a pressure of 0.6 inch, and with such flow as just to commence flickering, indicated by the meter a discharge of 4.74 feet per hour. As the discharge of a gas from a given orifice, under given pressure, is inversely as the square root of its density, it appears to me that it may fairly be inferred that the flow during my experiments at West Bloomfield must at least have approached

$$\frac{4.74 \times \sqrt{.42}}{\sqrt{.7}} = 3.83 \text{ feet per hour.}$$

I need scarce remark that of course I am not to be understood as attaching exactitude to this figure, but it must answer our purpose provisionally, until direct and accurate determinations can be obtained, with the needful apparatus. Doubtless this estimate, of a seven-candle power with a flow of 3.83 feet, may be regarded as near enough for practical purposes. The application which I propose here to make of Mr. FARMER'S new rule is to bring out by its means the candle-power which we ought to obtain from the crude gas of the well with burners adapted to burn five feet per hour of this heavy gas. By FARMER'S theorem

$$\frac{7 \times 5 \times 5}{(3.83)^2} = 11.72 \text{ candles.}$$

On the osher hand, calculation by the simple rule of three gives us only

$$\frac{7 \times 5}{3.83} = 9.14 \text{ candles.}$$

In our next I intend to introduce some remarks upon the effect on the candle-power, of removing the ten per cent. of carbonic acid from this gas.

HENRY WURTZ.

[Dr. STEVENS has been kind enough to hand us the following note, which is of great value and interest in connection with the above, and generally, in relation to the sources of the natural combustible gases emitted from our Palaeozoic Rocks. We shall entitle it:

THE GEOLOGY OF THE GAS WELLS OF THE EASTERN UNITED STATES.

The farm of Mr. Beebe, in the town of West Bloomfield, is understood to be in the valley of the outlet of Honeyoye Lake. The valleys of drainage in this part of the State are in a north and south direction. At West Bloomfield the geological formation is the Hamilton Group. In the town next north, viz, Victor, the Marcellus Shale outcrops. The formations here dip southwards. There can be no doubt therefore that the gas-discharging horizon of the Beebe well is that of the Marcellus Shale. This Shale, as is well known, is highly charged with bitumen and carbonaceous matter; so much so as often to be mistaken for coal. Some portions of it will emit flame on ignition. In the next parallel valley of erosion in this county, viz., that of Mud Creek, and in the second parallel range of township, South Bristol, another black slate appears, also charged with bitumen and carbonaceous matter. This is the Genesee Slate, and here is found the celebrated Burning Spring, from which gas has been poured out since the first knowledge of the country. This is also the geological horizon of the gas springs of Seneca Lake, and southern shore of Lake Erie.

In the village of Salineville, Ohio, on the Saline Branch of Yellow Creek, there is a strong blowing spring issuing from a bore made for salt water. This well probably reaches into the sub-carboniferous, which is a saliferous rock. As is well known, along Oil Creek, in Pennsylvania, many artificial gas springs were made during the progress of boring for oil. Their geological horizon is that of the upper members of the Devonian, or Chemung and Portage Groups.

These, then, are the four great horizons of gas-producing rocks of New ork, Pennsylvania and

Ohio, which have passed under my personal observation.

R. P. STEVENS.

☞ We have received a report of the Louisville Gas Company, showing its operations for the past year, its present financial condition, and otherwise, which has been crowded out of this issue of the Journal, but shall appear in our next.

The Manufacture of Ice.

The Philadelphians are engaging very extensively in the manufacture of artificial ice. The materials employed are water, spirits of ammonia, steam and salt. The retort is used for the heating of the ammonia. A coil of pipe, through which steam passes, winds around the interior. Eight hundred gallons of the ammonia are poured into the retort, and about twenty-four pounds of steam applied. The gas arising from the ammonia is conveyed into a pipe at top of the retort. The pipe passes into a cooler filled with water, and thence into the liquifier. It is now thoroughly chilled and deprived of its carbonic principles, and becomes a freezing cold liquid. Connected with the condenser is a pipe which carries the liquid into a series of pipes, which diverge through the freezing box. The latter is filled with a strong solution of salt and water, which, with the aid of the liquid ammonia in the pipes causes an intense cold. Into the freezing box are introduced forty-eight brass boxes filled with fresh water, each of them producing a twenty-four pound slab of ice, four inches in thickness, two feet in length and one in breadth. It requires four hours to freeze the forty-eight boxes. The cost of this ice is about fifty per cent less than that of ordinary ice.—*Polytechnic.*

Answers to Correspondents.

A. L. B., of Cal.—It is not true as you see it stated in newspapers, that a German or Polish chemist has discovered how to produce precious stones and diamonds *instantaneously*, by evaporating some peculiar silicic and aluminous ethers. *Time* is essential to all crystallization proportionate to perfection and hardness, and any tyro in the science of crystalology and chemistry knows the story to be a sensational *canard.*

D. T., of New York.—*Chinese Cement* is made by dissolving shellac in strong alcohol, to the consistency of molasses. *Japanese Cement* is made by mixing finely powdered rice with a little cold water, and add gradually boiling water, with constant stirring until of a proper consistence, after which it is to be boiled one minute. It will then be white and semi-transparent, and is superior for paper work and any purpose when a strong cement is needed.

T. N., of Pa.—A gas which by combustion of five cubic feet per hour, produce a light equal to 15 spermacetti candles, may be considered a gas of good illuminating power. Gas should be absolutely free from sulphuretted hydrogen. The right pressure for economical consumption should not be over six tenths of an inch water pressure at the burner; that is, it should balance a column of water six-tenths of an inch.

J. A. T., of Ind.—Some varieties of bituminous coal yield in gas retorts six per cent. of their weight in tar seven per cent. water, seventeen per cent. gas, that occupies 276 times the original volume of coal, and 70 per cent coke. For the conversion of 100 lbs. of coal into gas and coke about 28 lbs. of coke will be consumed in the grate for fuel.

G. R., of N. C.—Lime is employed in the purification of gas, to remove the sulphur, ammonia, and carbonic acid. The washers tend to remove the condensable hydro-carbons, and therefore *do* diminish the candle-power of rich gas. Bunsen's work on Gasometry will give you much information on this subject—of the loss by absorption.

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O. B. BUTLER, 125 Maiden Lane.

NOTICE.—WILL CHARLES GREENE, WHO had an Electrical Engine on exhibition at the late Mechanics' Institute Fair in this city, please send his address to the Editors of this Journal, and oblige.

Will CHARLES JONES of Philadelphia, who sent us a communication a few weeks ago, about Hydrogen Gas Apparatus, please communicate his present address.

RETORT SETTING, ALTERATIONS AND EXTENSION OF GAS WORKS, by JOHN KEELING, Gas Engineer, from London. Plans and Estimates furnished.

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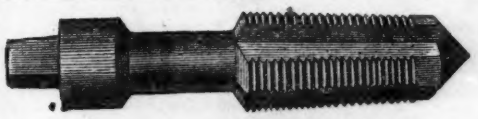

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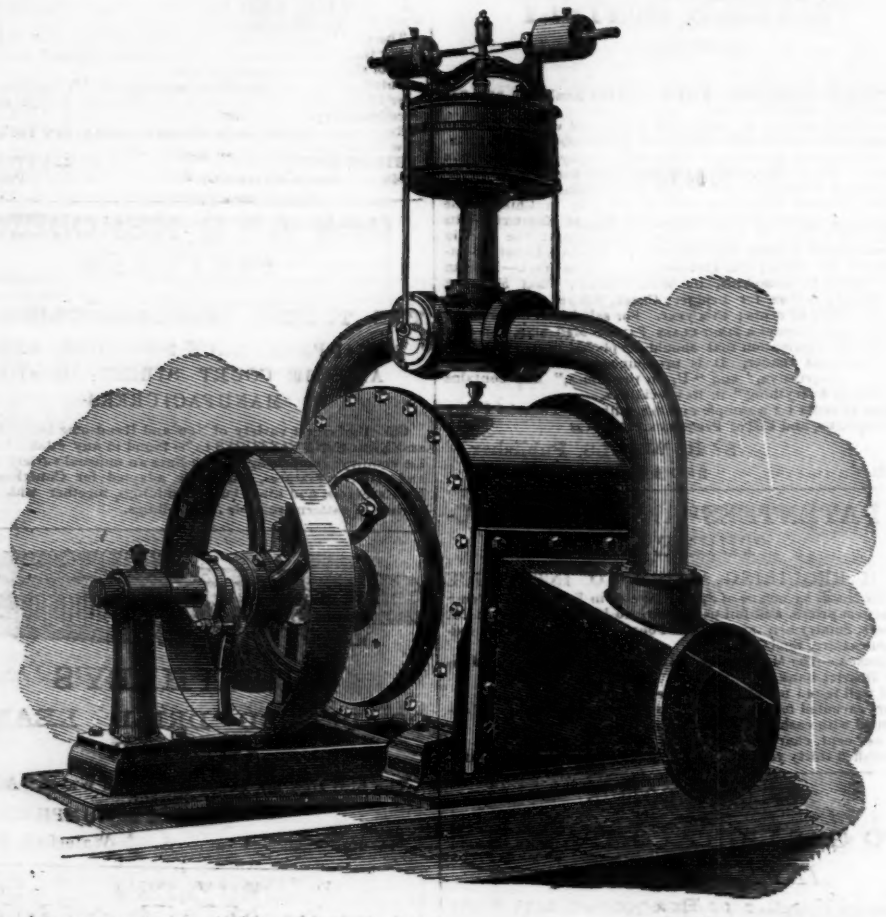

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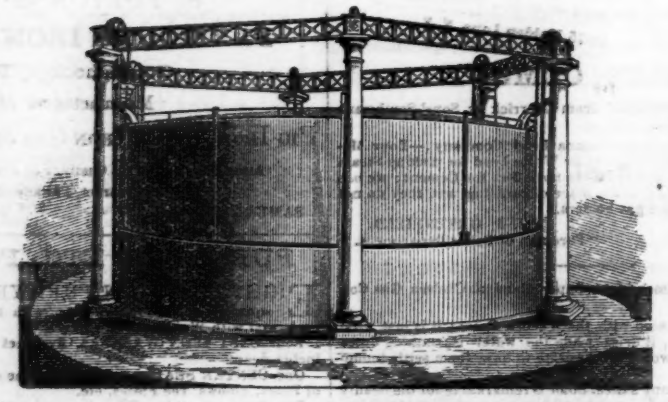

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FIG. 1.

Fig. 1 shows a single gate valve.

Fig. 2 represents wedge and one-half of gate of double valve, intended for larger sizes, when required to bear heavy pressure either side.

Fig. 3, represents a section through body, gate and wedge.

The slides, G G, are held against wedge D, by ribs, H H, projecting from sides of valve body, A.

In closing the valves, when opening I is covered, slides, G G, pass the lower ends of ribs, H H, when the wedge, D, can move forward on the inclined planes E E, and crowd the gates apart.

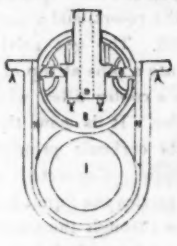

FIG. 3.

FIG. 2.

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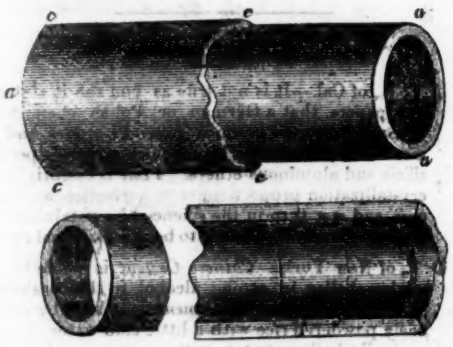

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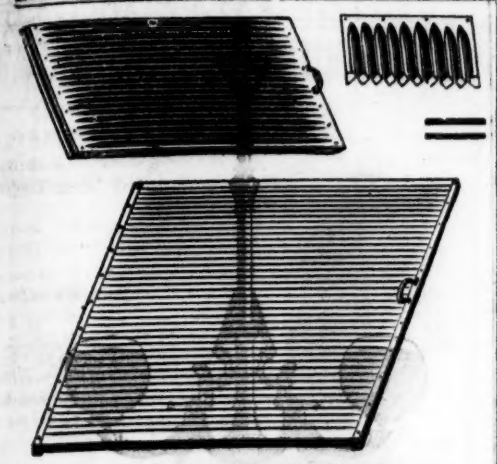

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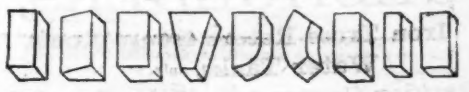

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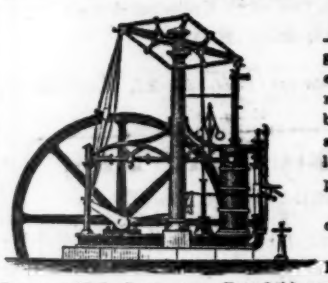

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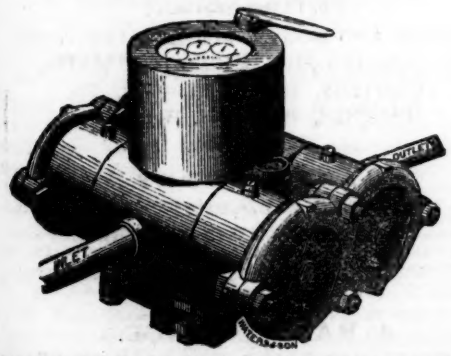

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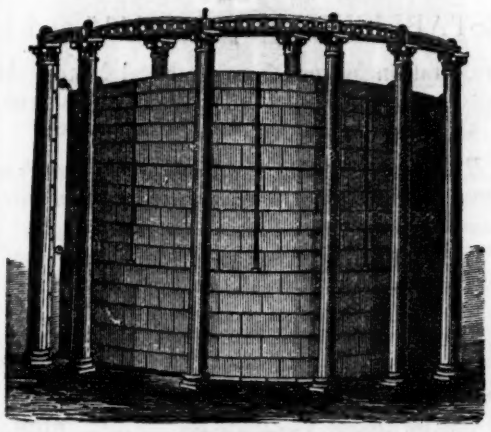

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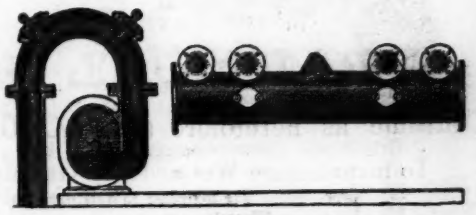

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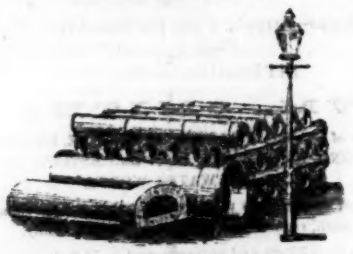

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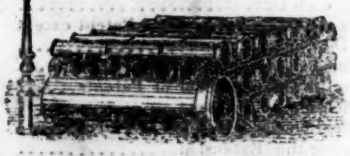

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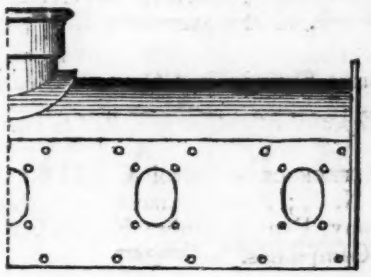

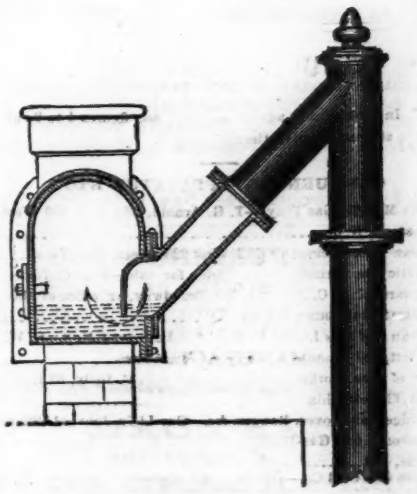

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